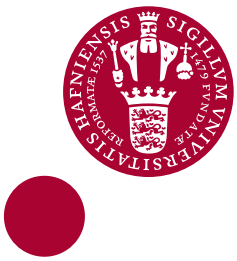

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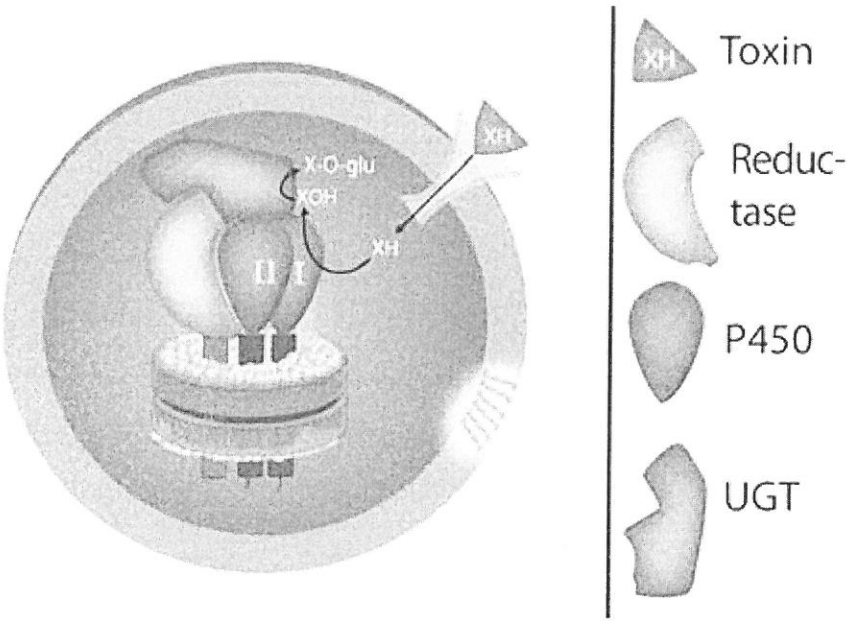

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An Arabidopsis family 31 glycosyltransferase transfers Gal onto extension peptide and is essential for embryogenesis

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Plant cell walls are the earth's most abundant source of biomass. They are an important renewable resource of high-value biopolymers with diverse industrial applications. A better understanding of the biosynthesis of the cell wall polysaccharides may enable development of crops with improved properties as biofuel feedstocks. Plant cell walls are composed mainly of polysaccharides. Despite rather detailed information on the chemical structure of the cell wall polysaccharides, little is known about their biosynthesis. The key enzymes plays a role in the biosynthesis are glycosyltransferases (GTs). In the model plant, Arabidopsis thaliana, approximately 450 GT genes have been identified based on their sequence and deposited to more than 70 families in the CAZy database (Carbohydrate Active Enzyme: www.cazy.org). Among these, approximately 200 GTs are estimated to be involved in the biosynthesis of plant cell wall polysaccharides, but only a few GTs have had their activity demonstrated to date. We have cloned more than 100 GTs in Gateway vectors in order to heterologously express the enzymes and characterize their activity (EU FP6 WALLNET).

Here, we present one of the GTs from family 31, which we identified encoding enzyme activity recently. The enzyme has an essential role in plant growth and development since homozygous knock out mutations in the corresponding gene result in an embryo-lethal phenotype. During early stages of embryo development, the enzyme is expressed specifically in suspensor cells. Other than embryonic stage, the enzyme is expressed in meristematic tissues such as shoot and inflorescence apex. We have expressed the soluble domain of the enzyme as an N-terminal GST fusion in *E.coli*. Among various donor-substrates and acceptors tested, the purified enzyme showed galactosyltransferase activity onto extensin glyco-motif: $(Ser\text{-}HyP\text{-}HyP\text{-}HyP)_3$. Gal was incorporated onto Ser residue rather than hydroxyl Pro residues. Interestingly, overexpression of this galactosyltransferase in plants increased the galactose content of type II Arabinogalactan.